

Madden/Julian Oscillation:
Recent Evolution, Current
Status and Forecasts

Update prepared by
Climate Prediction Center / NCEP
January 29, 2007

Outline

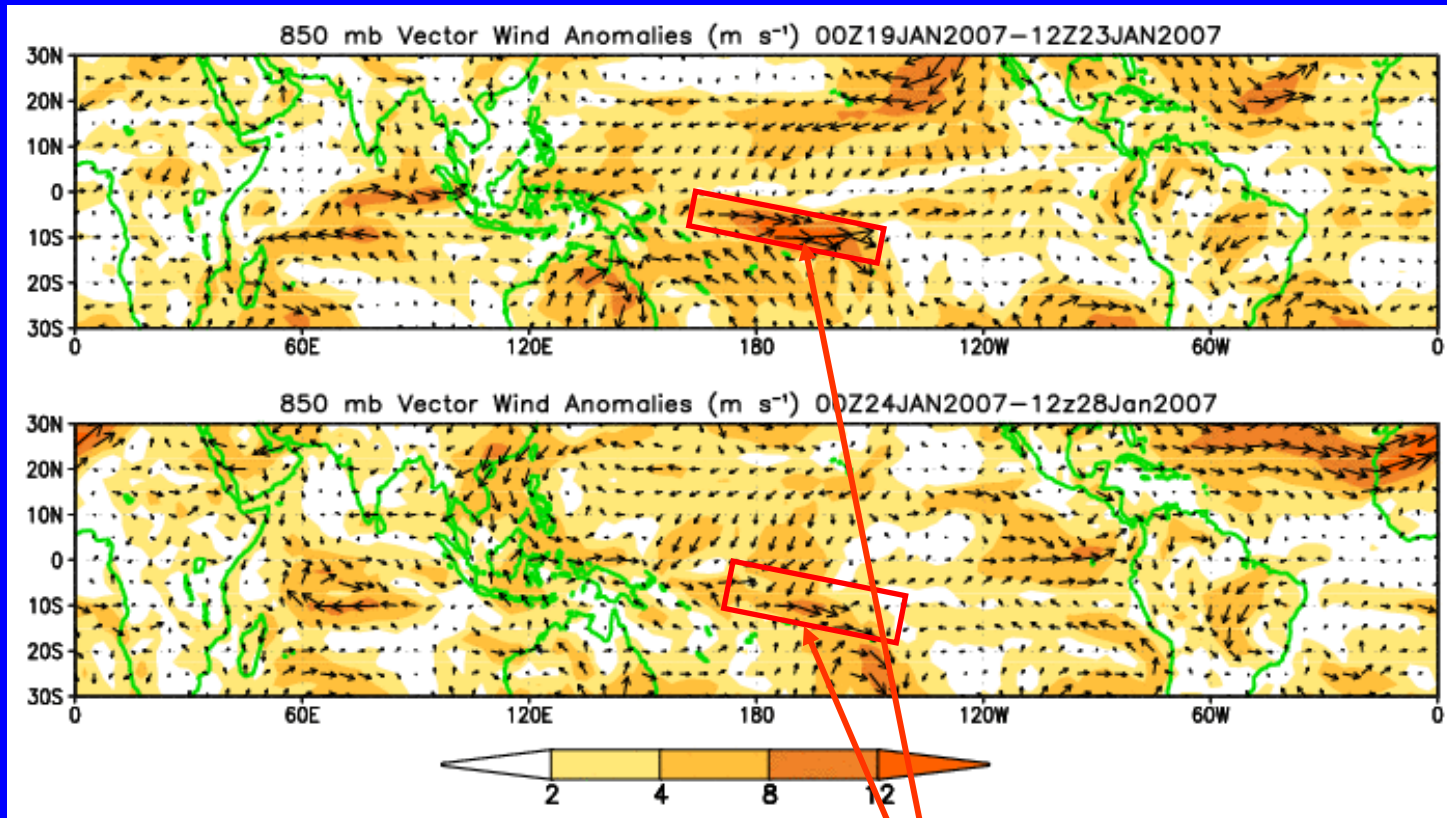
- **Overview**
- **Recent Evolution and Current Conditions**
- **Madden Julian Oscillation Forecast**
- **Summary**

Overview

- **The latest observations indicate that the MJO has become incoherent.**
- **During weeks 1 and 2, there is an increased chance for above-normal rainfall over the central and western tropical Pacific Ocean, southeast Africa and Madagascar. Favorable conditions exist for tropical cyclogenesis along the north and northeast coast of Australia throughout the period.**
- **Additional impacts for week 1 only include an increased chance of above normal rainfall over portions of Southeast Brazil and favorable conditions for tropical cyclogenesis for the central tropical Pacific, just east of the Date Line.**
- **Tropical cyclone Dora will impact portions of the southern Indian Ocean east of Madagascar during week 1.**

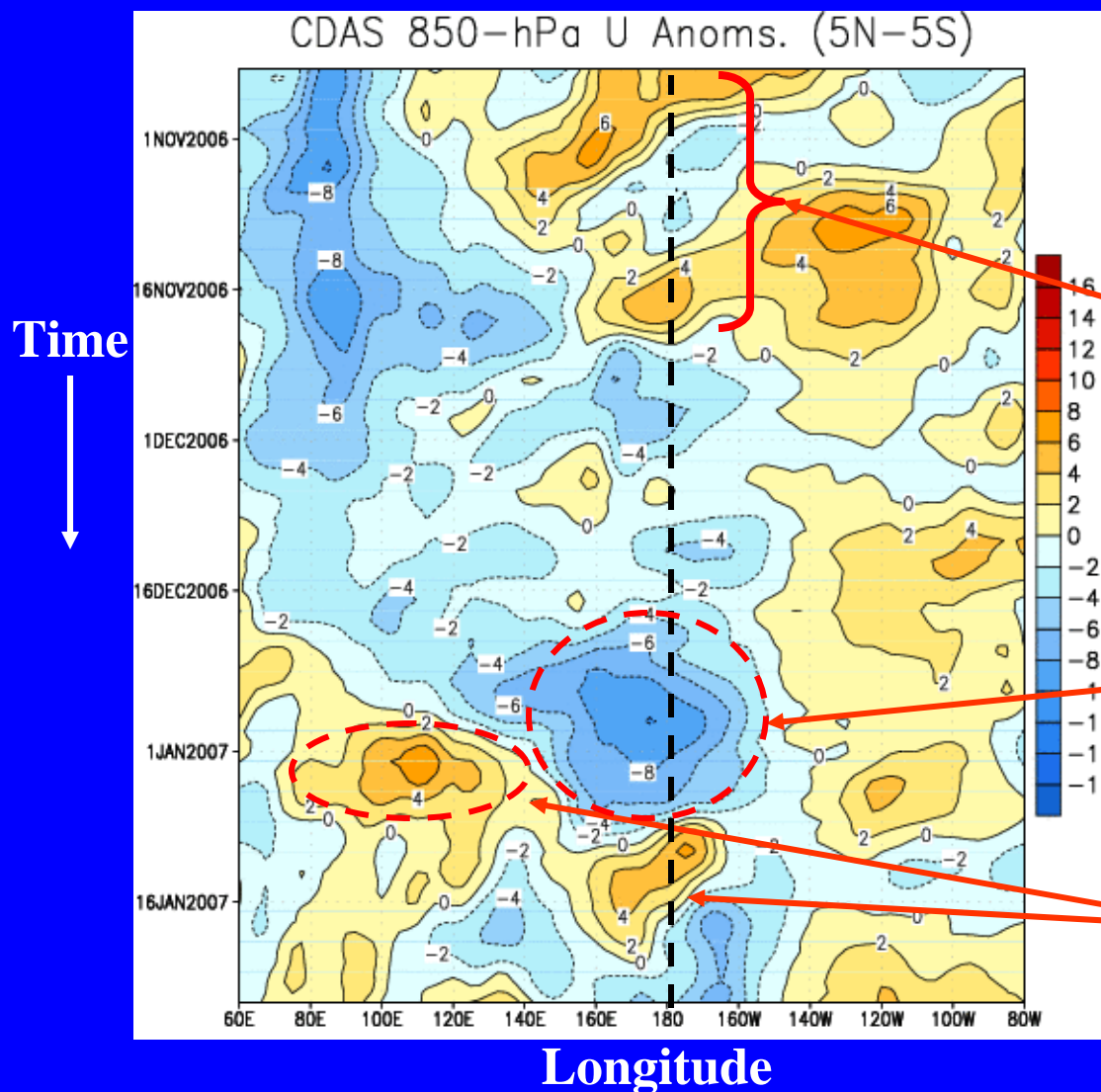
850-hPa Vector Wind Anomalies (m s^{-1})

Note that shading denotes the magnitude of the anomalous wind vectors



Westerly anomalies along 5°S in the central tropical Pacific (170°E - 150°W) weakened during the last 5 days.

Low-level (850-hPa) Zonal (east-west) Wind Anomalies (m s^{-1})



Westerly anomalies (orange/red shading) represent anomalous west-to-east flow.

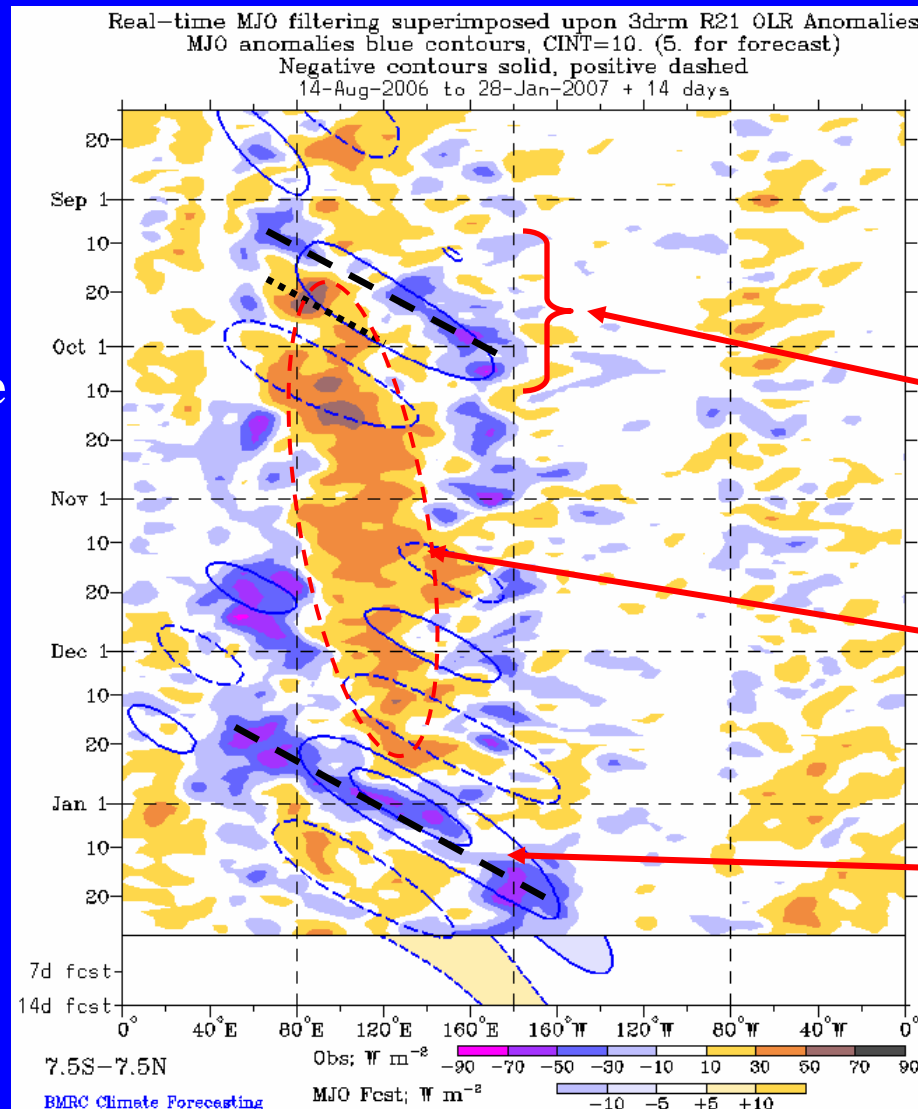
Easterly anomalies (blue shading) represent anomalous east-to-west flow.

Periods of westerly anomalies were frequent near and west of the Date Line (vertical dashed line) during October, and early November 2006.

Strong easterly anomalies, observed near the Date Line in late December 2006, weakened in early January 2007.

Westerly anomalies were observed over the equatorial Indian Ocean and Indonesia in late December 2006, and over the central equatorial Pacific during early January 2007.

Outgoing Longwave Radiation (OLR) Anomalies (7.5°S-7.5°N)



Drier-than-average conditions, positive OLR anomalies (/red shading)

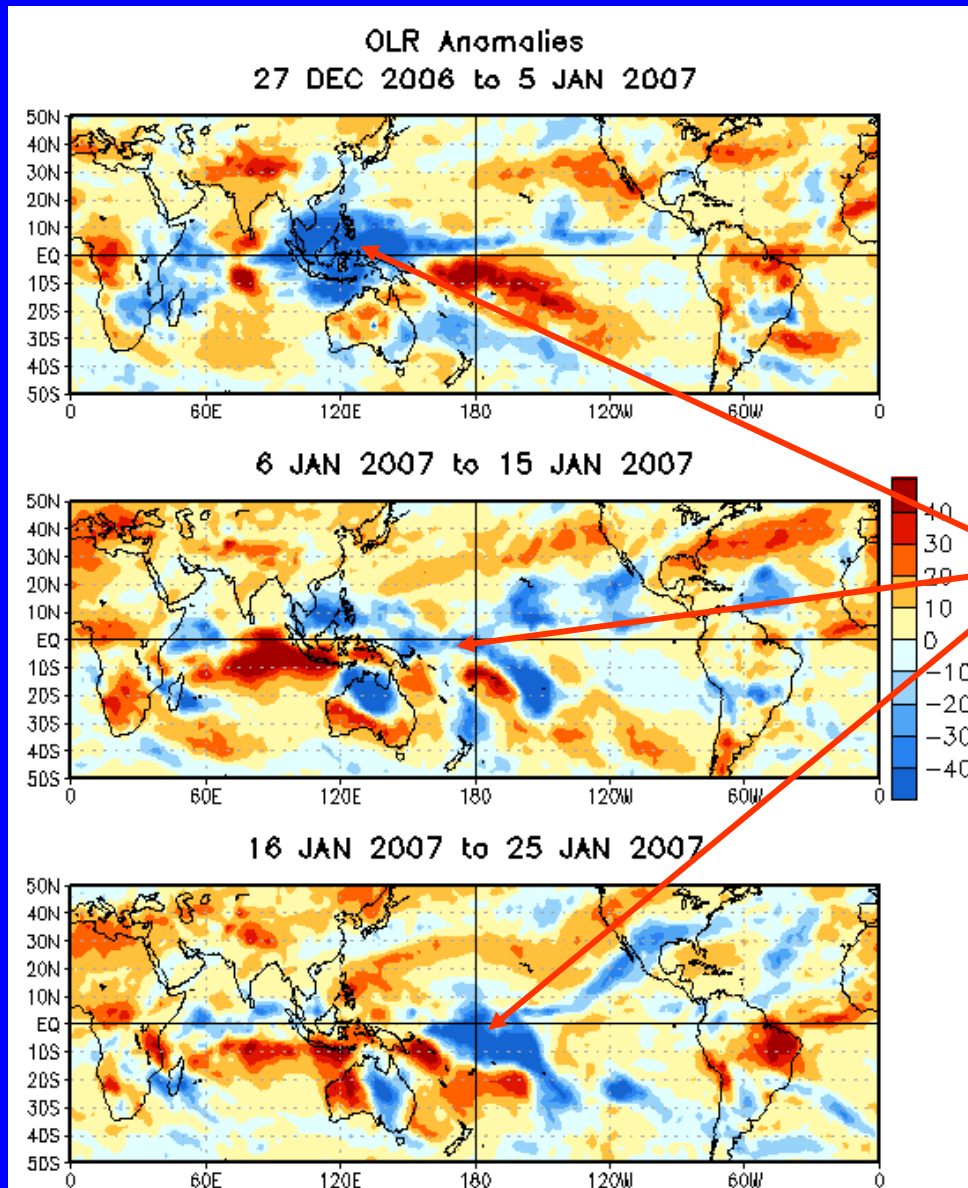
Wetter-than-average conditions, negative OLR anomalies (blue shading)

Negative OLR anomalies associated with the MJO propagated eastward from the Indian Ocean to the western Pacific Ocean beginning in early September.

Strong suppressed convection was evident across the Maritime Continent (100E-150E) from late September to mid-December.

Enhanced convection, associated with the recent MJO event, shifted eastward from the Indian Ocean across the Maritime Continent and western Pacific between late December 2006 and early January 2007, and into the central tropical Pacific during the last two weeks.

Anomalous OLR: Last 30 days



Drier-than-average conditions, positive OLR anomalies (red shading)

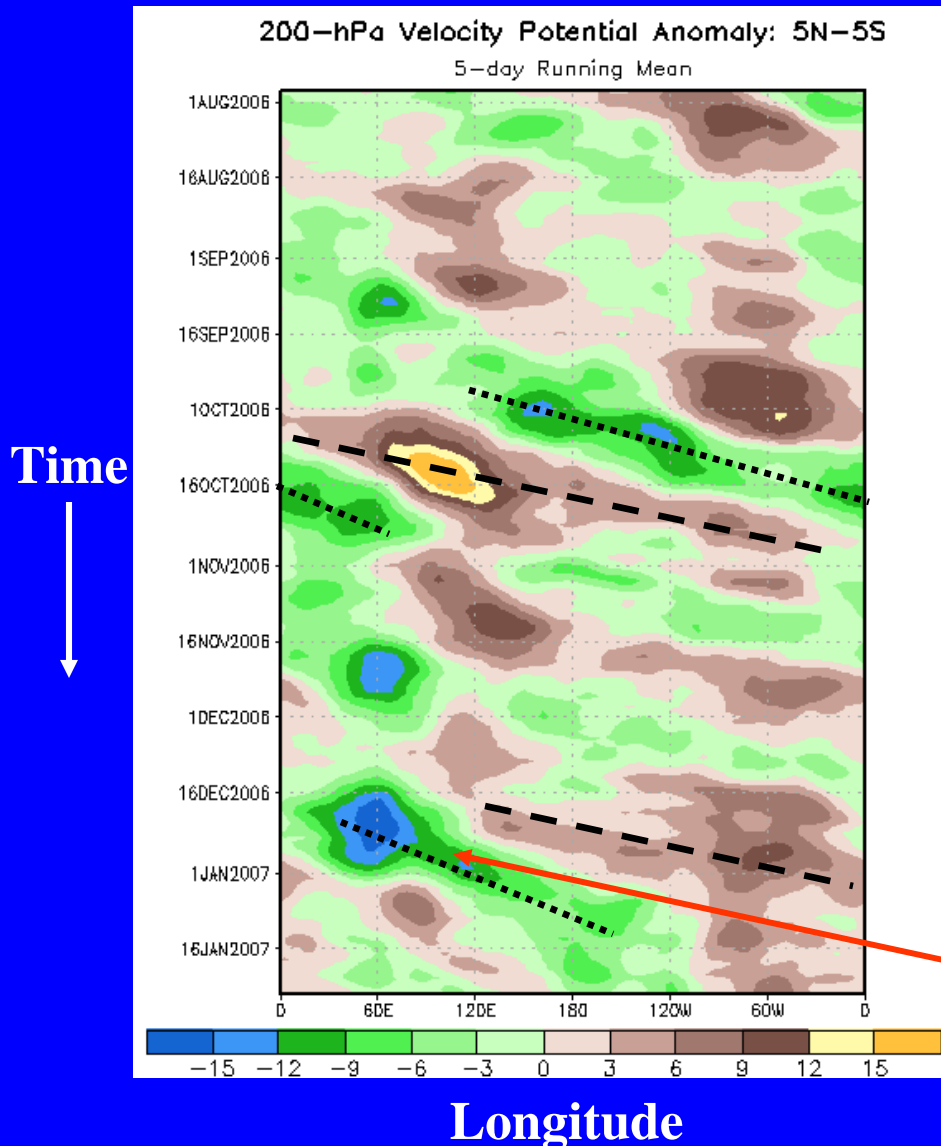
Wetter-than-average conditions, negative OLR anomalies (blue shading)

An extensive area of enhanced convection developed in the Indian Ocean in mid-December, expanded eastward to include the Maritime Continent by late December/ early January, and shifted eastward to the central tropical Pacific in January 2007.

200-hPa Velocity Potential Anomalies (5°S-5°N)

Positive anomalies (brown shading) indicate unfavorable conditions for precipitation.

Negative anomalies (green shading) indicate favorable conditions for precipitation.



The MJO was incoherent during much of July, August, and September.

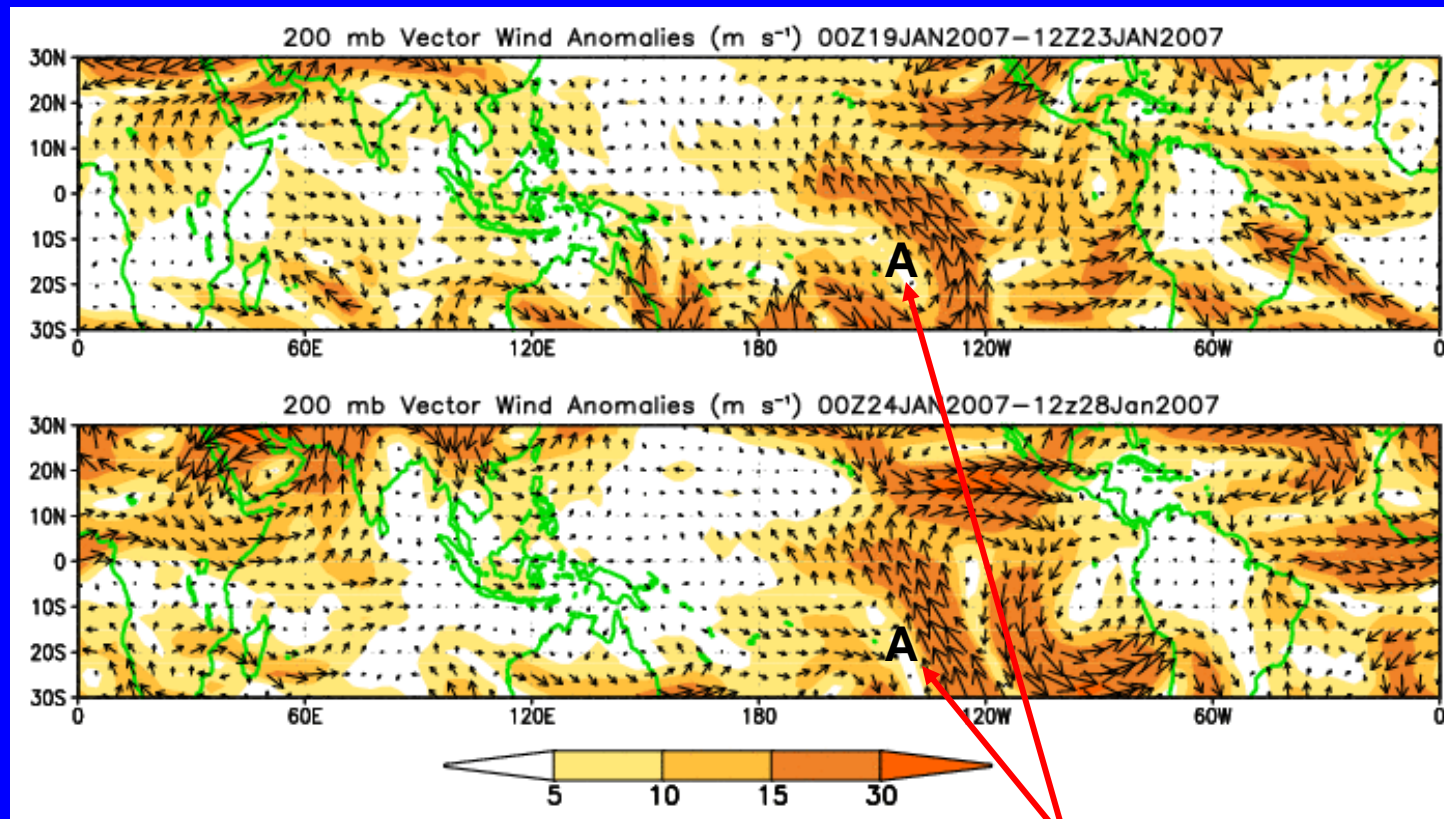
Moderate to strong MJO activity was observed from late-September to mid-October.

The MJO weakened considerably during the late October to early December time period.

The MJO intensified in late December 2006, as negative OLR anomalies shifted eastward from the Maritime continent into the central tropical Pacific (see slides 6 & 7). Recently the MJO has weakened.

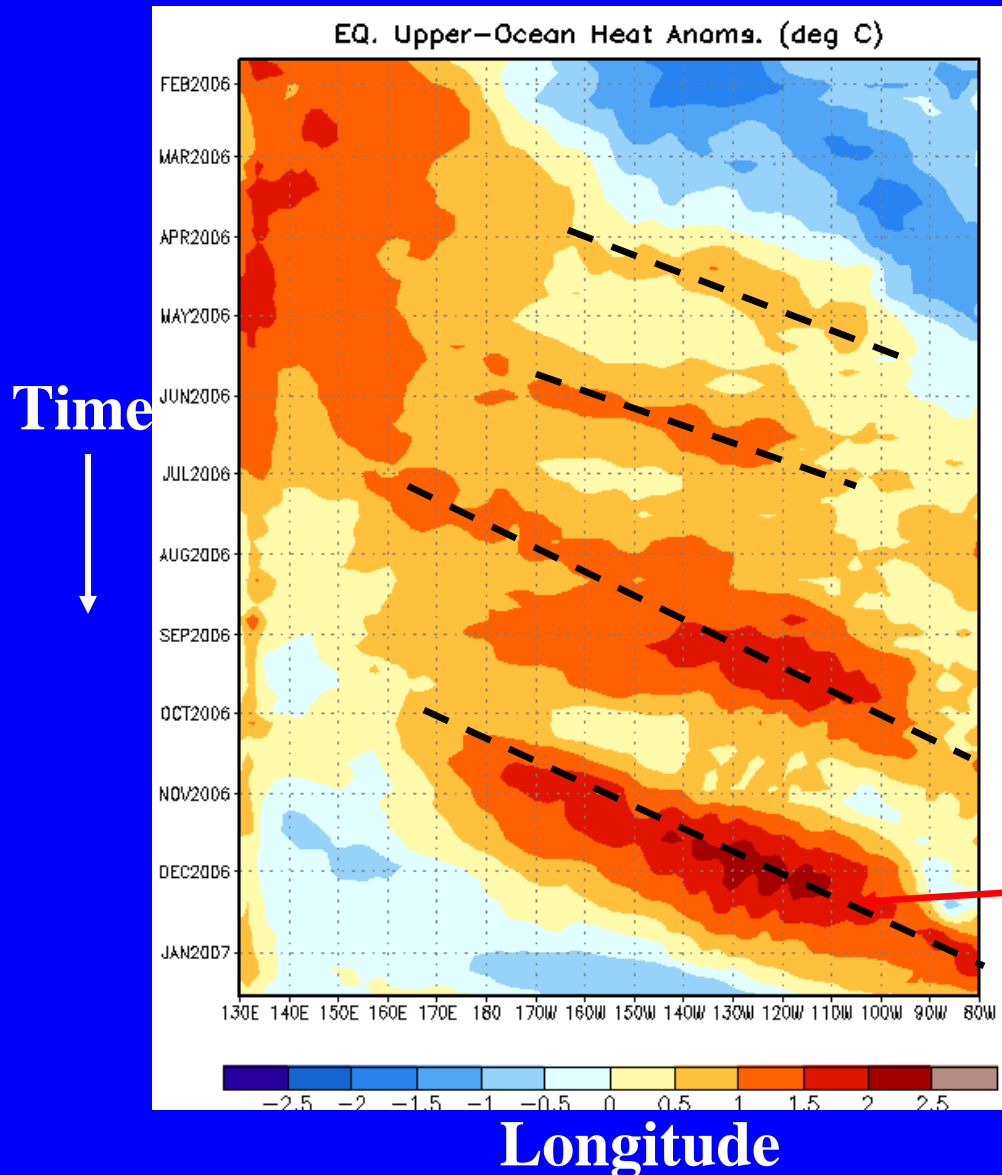
200-hPa Vector Winds and Anomalies (m s^{-1})

Note that shading denotes the magnitude of the anomalous wind vectors.



An anomalous 200-hPa wind anticyclonic circulation center has been observed just east of enhanced convection (cloudiness and precipitation) along the South Pacific Convergence Zone (SPCZ) (see slide 7).

Heat Content Evolution in the Eq. Pacific



Starting in April, above normal upper oceanic water temperatures expanded from the western Pacific into the eastern Pacific.

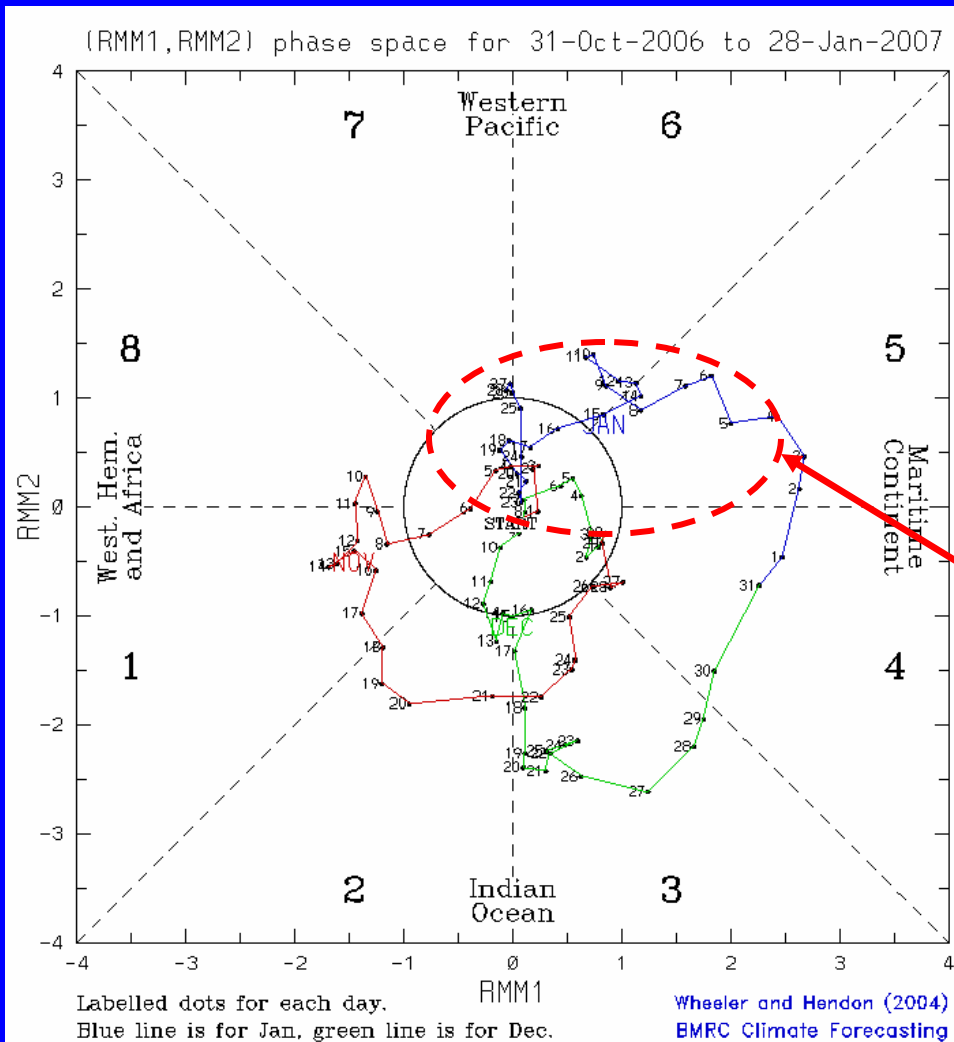
During this period eastward-propagating Kelvin waves (warm phases indicated by dashed lines) have caused considerable month-to-month variability in the upper-ocean heat content.

The latest Kelvin wave was initiated in early October and is the strongest in over a year. Anomalously warm waters have reached the coast of South America.

MJO Index (Magnitude and Phase)

The current state of the MJO as determined by an index based on Empirical Orthogonal Function (EOF) analysis using combined fields of near-equatorially-averaged 850-hPa zonal wind, 200- hPa zonal wind, and satellite-observed outgoing longwave radiation (OLR) (Wheeler and Hendon, 2004).

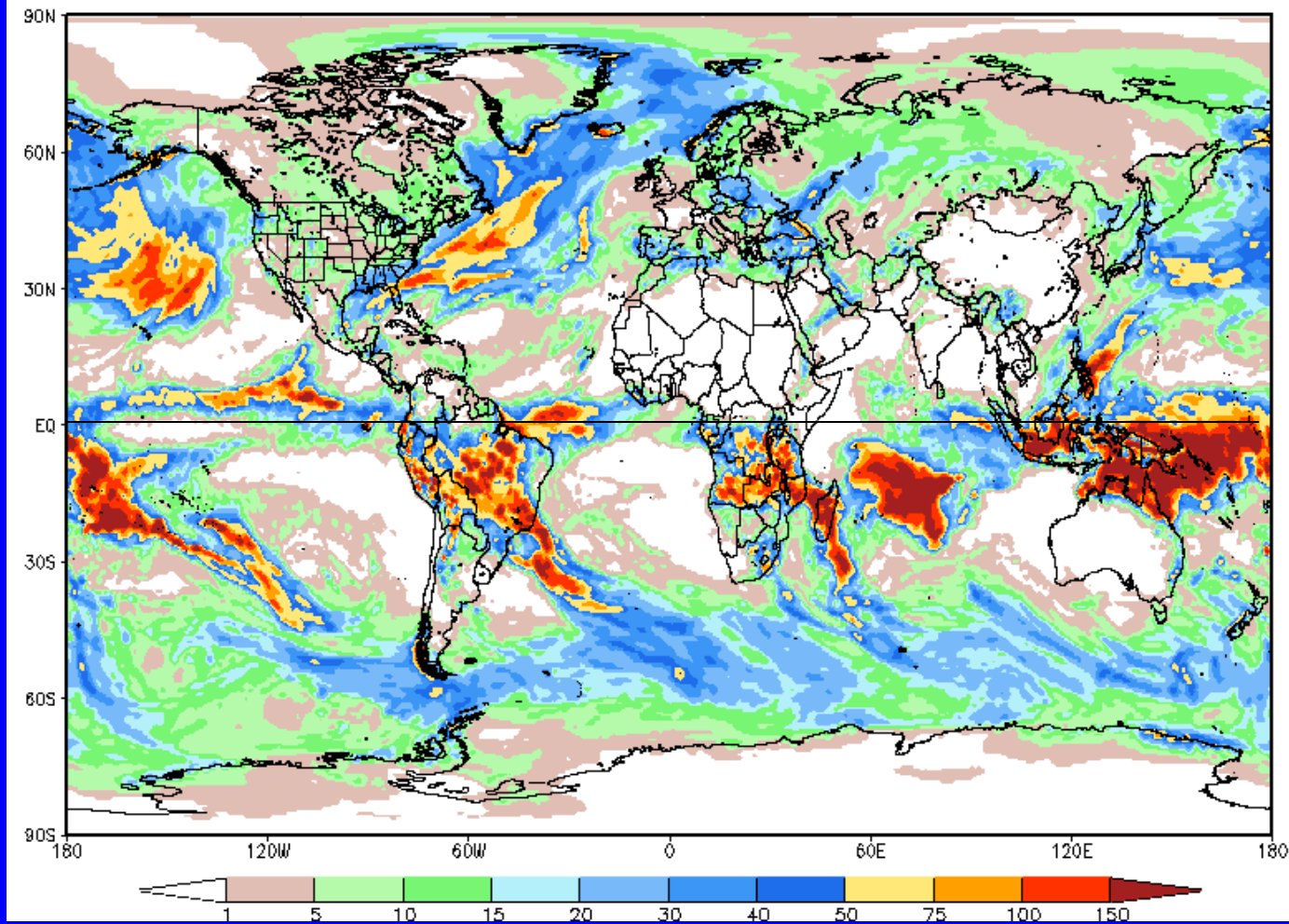
The axes represent the time series of the two leading modes of variability and are used to measure the amplitude while the triangular areas indicate the phase or location of the enhanced phase of the MJO. The farther away from the center of the circle the stronger the MJO. Different color lines indicate different months.



The MJO weakened and became incoherent in early January.

Global Forecast System (GFS) Week 1 Precipitation Forecast

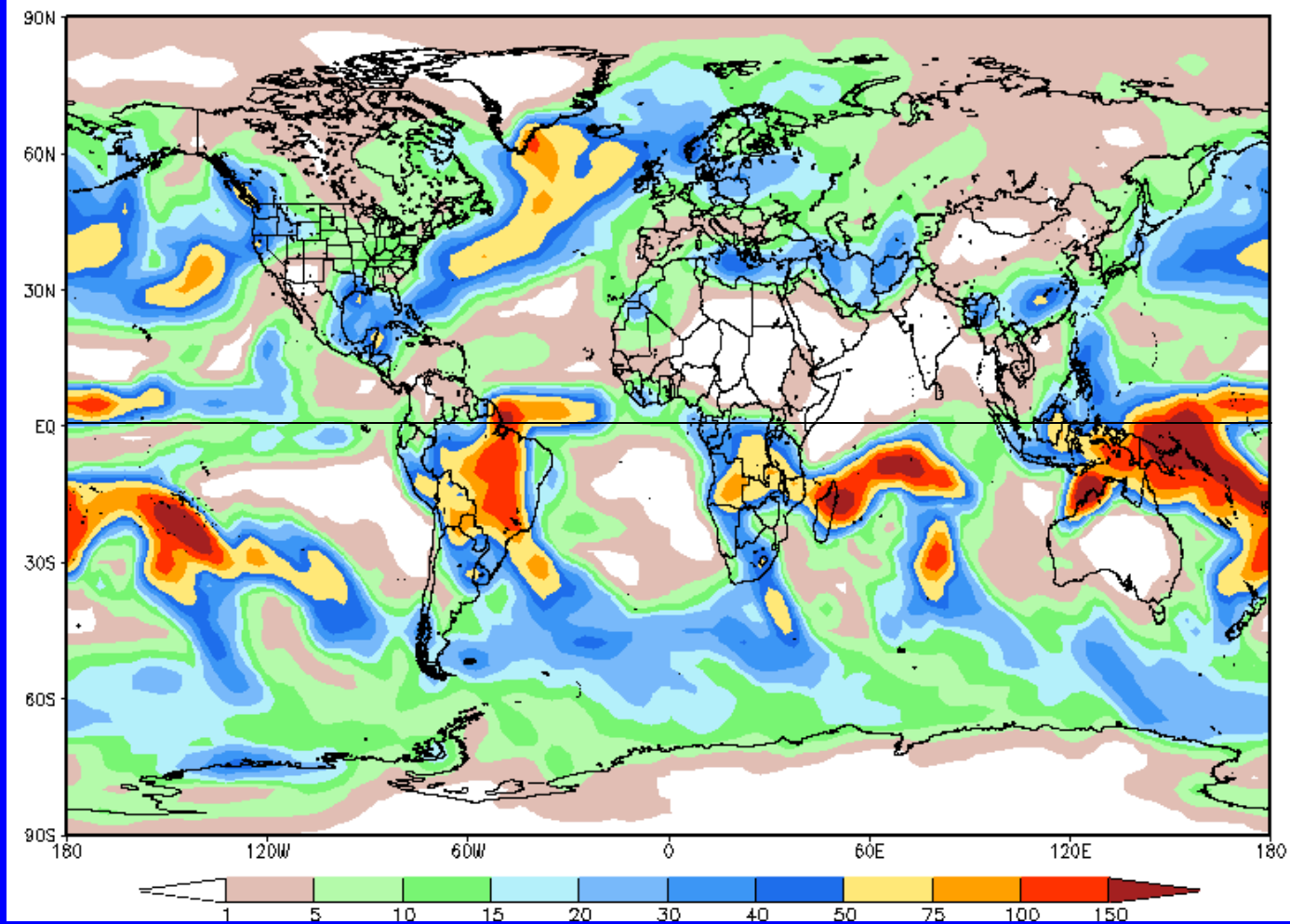
NOAA GFS 37.5 km Week 1 Total Precipitation (mm)
Issued at Jan 29 2007 00Z for the period ending at Feb 5 2007 00Z



Global Forecast System (GFS) Week 2

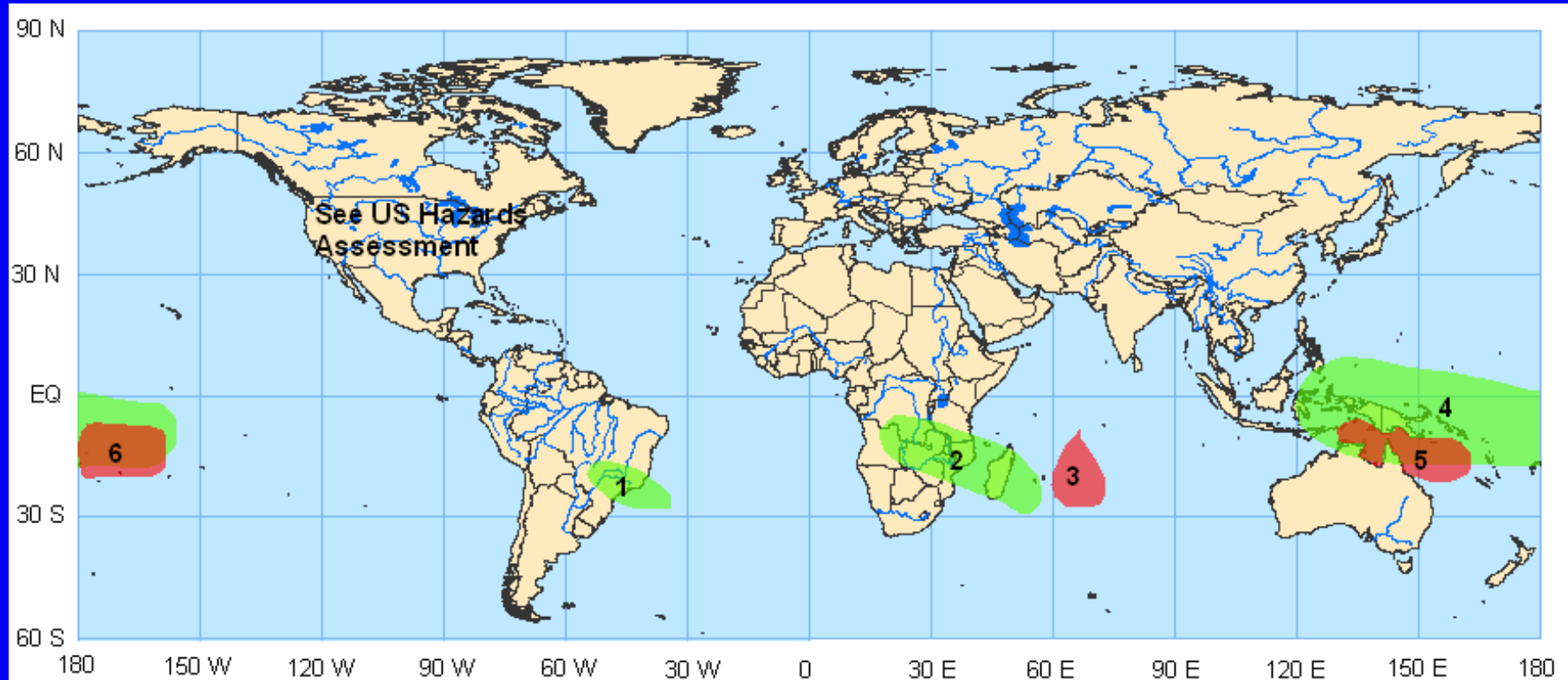
Precipitation Forecast

NOAA GFS 100 km Week 2 Total Precipitation (mm)
Issued Jan 29 2007 00Z for the period ending at Feb 11 2007 00Z



Potential Benefits/Hazards – Week 1

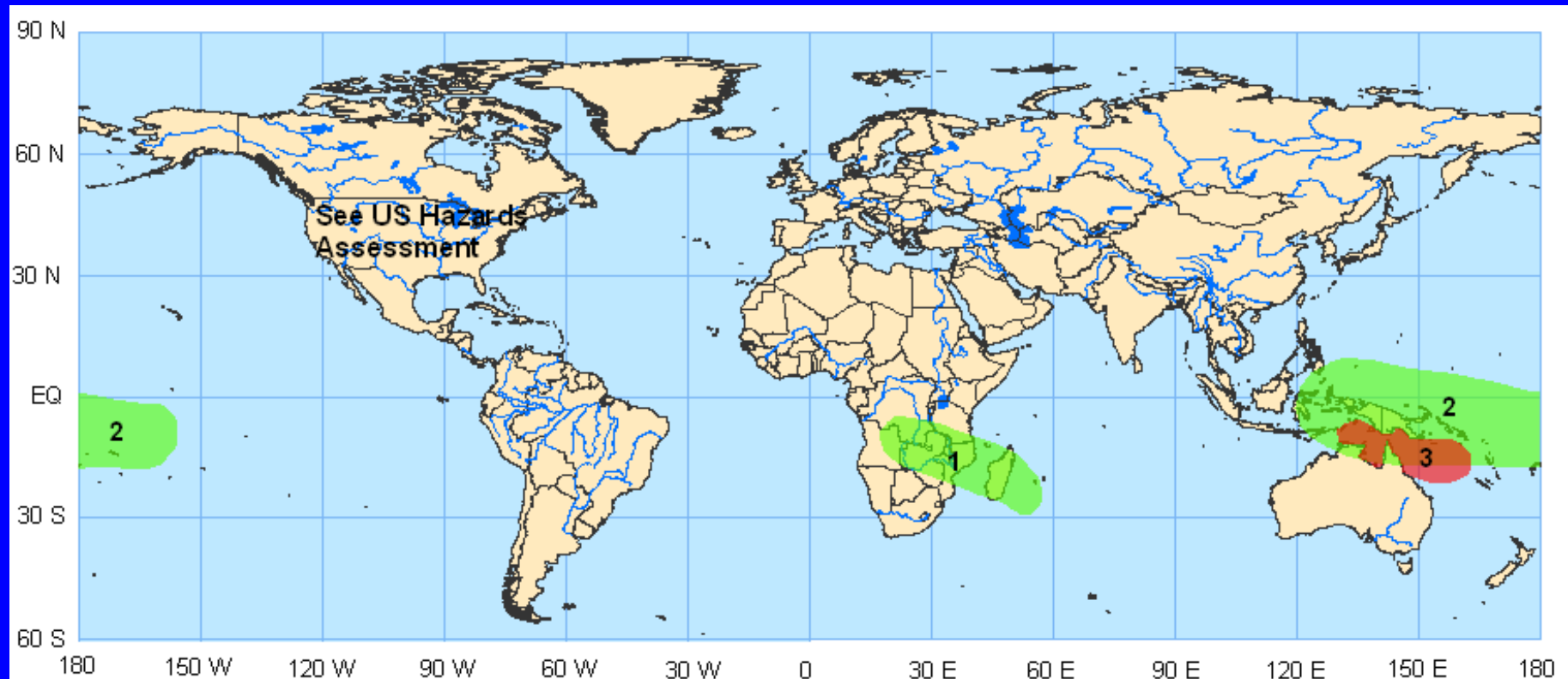
Valid 30 January-5 February 2007



1. An increased chance for above normal rainfall over portions of Southeast Brazil.
2. An increased chance for above normal rainfall over southeastern Africa and Madagascar.
3. Tropical cyclone Dora will impact sections of the southern Indian Ocean east of Madagascar.
4. An increased chance for above normal rainfall over portions of the central and western tropical Pacific (including eastern Indonesia).
5. Conditions favorable for tropical cyclogenesis along the north and northeast coast of Australia.
6. Conditions favorable for tropical cyclogenesis over the central tropical Pacific, just east of the Date Line.

Potential Benefits/Hazards – Week 2

Valid 6-12 February 2007



- 1. An increased chance for above normal rainfall over Southeastern Africa and Madagascar.**
- 2. An increased chance for above normal rainfall over portions of the western and central tropical Pacific and over eastern Indonesia.**
- 3. Conditions favorable for tropical cyclogenesis along the north and northeast coast of Australia.**

Summary

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